CAUCASIANA
Journal on the biodiversity of the Caucasus and the adjacent regions

Caucasiana 3: 263–271 (2024)
DOI: 10.3897/caucasiana.3.140259

Research Article

On the presence of *Hipparchia parisatis* (Kollar, 1849) in the Republic of Georgia (Lepidoptera, Nymphalidae, Satyrinae)

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Abstract

The first records of the highly distinctive Nymphalid species *Hipparchia parisatis* (Kollar, 1849) from the Republic of Georgia (Vashlovani Nature Reserve, hereafter VNR) are reported. The taxonomy and distribution of the species in the South Caucasus region are discussed, and the importance of the Vashlovani Protected Areas (hereafter VPA) as a hotspot for butterfly diversity in Georgia is emphasized. The report also highlights the importance of active collaboration, at the interface of web-based data recording platforms, between professional biologists and citizen science initiatives for the effective advancement of biodiversity research and conservation.

Key words: biodiversity, citizen science, conservation, new records, Papilionoidea, South Caucasus, Vashlovani

OPEN ACCESS
Academic editor: Levan Mumladze
Received: 25 October 2024
Accepted: 6 December 2024
Published: 11 December 2024

ZooBank: https://zoobank.org/2A801BA3-C512-486A-A37C-5545527A1A85

Citation: Kolev Z, Novák J, Seropian A (2024) On the presence of *Hipparchia parisatis* (Kollar, 1849) in the Republic of Georgia (Lepidoptera, Nymphalidae, Satyrinae). Caucasiana 3: 263–271. https://doi.org/10.3897/caucasiana.3.140259

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Introduction

Hipparchia parisatis (Kollar, 1849) is one of the most distinctive species in the genus *Hipparchia* Fabricius, 1807. The most distinctive character on the upperside of the wings in both sexes is the striking white coloration of the hindwing margin (which has engendered the English vernacular of the species, the White-edged Rock Brown). This white margin is also present, but to a much lesser extent, along the forewing margin. There is only one other species with a similarly patterned upperside: *Hipparchia stulta* (Staudinger, 1882), which occurs in Central Asia. However, *H. stulta* is lacking the striking hindwing underside ocellation (Fig. 1) and transverse pattern of *H. parisatis*, and its underside is much more similar to that of e.g. *Hipparchia statilinus* (Hufnagel, 1766).
The confirmed range of *H. parisatis* lies in West and Central Asia and includes Turkey, Armenia, Azerbaijan, Iran, Iraq, Oman, Turkmenistan, Uzbekistan, Tajikistan, Afghanistan, Pakistan, NW India, and SW Tibet (Larsen and Larsen 1980; Tshikolovets 1998; Sbordoni et al. 2018; Schmidt et al. 2020). Across that extensive range, the subspecific taxonomy of the species is not unanimously agreed upon. The type locality of the nominal taxon "*Satyrus parisatis* Kllr." is

Iran, Farsistan (Schiraz, Persepolis) (Kollar 1849). From the geographical region of the South Caucasus (= Transcaucasia), the species-level nominal taxon "*Hipparchia* (*Satyrus*) *macrophthalmus*" was subsequently described (Eversmann 1851), with type locality in Armenia. The latter taxon was not, however, erected in juxtaposition with "*Satyrus parisatis* Kllr." but was described as "[differing a lot from the other *Satyrs* of Europe]", with specific reference to "l'Alcyone [*Hipparchia alcyone* [Denis & Schiffermüller], 1775 / *Hipparchia hermione* (Linnaeus, 1764): for the ongoing controversy in the nomenclature of this taxon, see Russell and Vane-Wright (2022) and Balletto et al. (2024)]", "l'Allionia [*Hipparchia statilinus*]", and "l'Actæa [*Satyrus actaea* (Esper, 1781)]". Subsequently, some recent authors (Hesselbarth et al. 1995) treated the taxon *macrophthalmus* Eversmann, 1851, as a synonym of *parisatis* Kollar, 1849, because of reportedly observed clinal variation across much of the range of the species. However, Sbordoni et al. (2018) recognized *macrophthalmus* as a distinct subspecies with a range stated as "Transcaucasia, E Turkey, N Iraq".

The general range of the species in the Caucasus region was stated by Nekrutenko (1990) to comprise "arid sparse woodlands, areas of mountainous xerophilic vegetation, and semi-deserts of southern Transcaucasia", without further details. Tshikolovets and Nekrutenko (2012) described the range of *H. parisatis* in the region to comprise parts of Armenia and Azerbaijan, i.e., the Armenian Upland, the Talish (Talysh) region, as well as the Kura and Aras (Araks) valleys with the adjacent mountains. Explicit published records from the third country in the South Caucasus, the Republic of Georgia, do not exist in a printed publication.

Materials and methods

In the course of field research funded by the Visegrad Scholarship Program in VNR (Dedoplistskaro Municipality, Georgia), the second author recorded a *Hipparchia* specimen and managed to photograph it in its natural setting, without disturbing or catching it. Owing to the distinctive appearance of the species in question (see Introduction and Fig. 1), further analysis of collected material has not been necessary. Following the deposition of the field record in iNaturalist and its tentative determination by the third author, the first author was contacted by the other authors with a proposal to jointly publish a note on the new country record from the Republic of Georgia. Further search by the first author in online citizen science platforms revealed the presence therein of several additional documented records of the species (Table 1). In total, the present publication is based on five photographic records of a total of five specimens from four localities, which shall be detailed below.

Table 1. Records of *Hipparchia parisatis* in Georgia.

Observer	Date	Coordinates	Elevation, m	Reference
Noé Terorde	01.10.2016	41.2159, 46.4331	580–590	https://observation.org
Sieglien De Roo	07.08.2019	41.2373, 46.3656	370-380	https://observation.org
Guido Rappé	21.09.2022	41.2373, 46.3758	420–430	https://observation.org
Karina Samyn	21.09.2022	41.2374, 46.3758	420–430	https://observation.org
János Novák	07.10.2023	41.2413, 46.3616	410-420	https://inaturalist.org

Figure 1. An adult of *Hipparchia parisatis* (Kollar, 1849) in its rocky habitat. Inset: enlargement of the specimen, with red arrows indicating the eyespots on the hindwing underside which are diagnostic for this species. © János Novák.

Abbreviations

IUCN – International Union for Conservation of Nature;
VNR – Vashlovani Nature Reserve;
VNP – Vashlovani National Park;
VPA – Vashlovani Protected Areas (comprising VNR and VNP);
WDPA – World Database on Protected Areas.

Results

The second author photographed a *Hipparchia parisatis* specimen on 7.10.2023 in VNR (Dedoplistskaro Municipality, Georgia). He deposited the record in iNaturalist, as follows. The first author – a validator for another online citizen science platform, Observation.org – conducted a search therein for further records of the species. This search uncovered four older records of the species in Observation.org, all documented with photographs and all from the same protected area in Southeast Georgia (VNR). These records include a single specimen photographed in 2016, a single specimen in 2019, and two specimens at the same time and place in 2022 (Observation.org 2024, Table 1). The locations of these records are shown in Fig. 2.

All records of *H. parisatis* listed in Table 1, are situated in VNR, a strictly protected reserve (WDPA ID № 1660, IUCN Management Category Ia) established in 1935. The records from 2019, 2022, and 2023 (respectively, № 3, № 4,

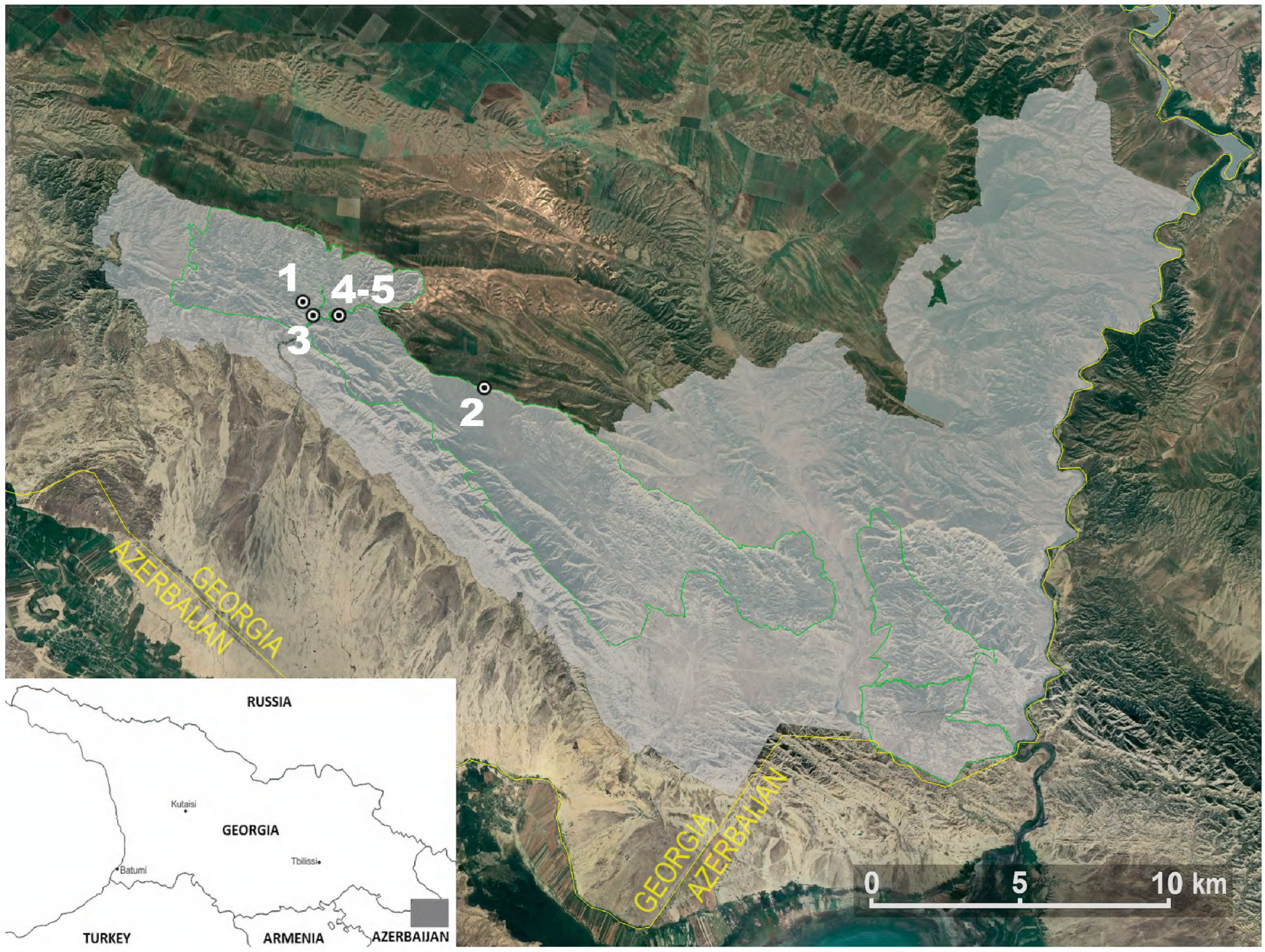

Figure 2. Records of *Hipparchia parisatis* (Kollar, 1849) from the Republic of Georgia (black-centred dots, with numbers corresponding to those in the text). Green line: border of VNR, grayed area: VPA, yellow line: state border. Inset: Map of the countries of the Caucasus area, with the area shown enlarged in the main map denoted by a grey rectangle. Map data © 2024 Google; satellite imagery © 2024 Airbus; base map produced with Google Earth Pro®.

№ 5, and № 1 in Fig. 2) were made in close proximity to one another, with the greatest distance between any two of them being ca. 1280 m and their plotted coordinates outlining a polygon with an area of only 22 ha. These habitats are all similar to one another as well: arid river gorges. The two records from 2022 (№ 4 and № 5 in Fig. 2) have been made one minute apart and come from the same locality, with the plotted distance between the two sets of coordinates being ca. 12 m. They thus record the simultaneous presence of two females of *H. parisatis* within a very small area, which indicates the presence of a breeding population of the species in VNR. The 2016 record (№ 2 in Fig. 2) is 5,3–6,6 km to the east-southeast of the other records and at a somewhat higher altitude. The altitudinal range of the records is 370–590 m.

The known habitats of *H. parisatis* in Georgia, Datviskheoba gorge and its vicinity, constitute semidesert with some light woodland dominated by *Pistacia mutica* and *Juniperus* spp. and dry steppe-like grassland dominated by *Artemisia* spp. and diverse grasses (Poaceae), grasses being the principal larval host plants of *H. parisatis* (Larsen and Larsen 1980; Gillett 2006). The habitat of *H. parisatis* and a general view of the area are shown in Figs 3–4.

Figure 3. Habitat of *Hipparchia parisatis* (Kollar, 1849) in VNR. © János Novák.

Figure 4. General view from the part of VPA where *Hipparchia parisatis* (Kollar, 1849) has been recorded. © János Novák.

The available records of *H. parisatis* from Georgia span the period from 07.08. to 07.10., which undoubtedly is just a part of the entire flight period of the species. It flies in a single generation, which emerges in May–June in the south of its range in Oman (Larsen and Larsen 1980) or in June–July in eastern Turkey, depending on altitude (Hesselbarth et al. 1995). After mating, females

aestivate during the hottest time of summer, after which they and some of the males reappear (Larsen and Larsen 1980). This phenomenon has given rise to erroneous claims that the species has two (de Freina 1978) or even three generations annually (Heydemann 1954). Early mating and delayed ovarian maturation are judged to lead to oviposition in autumn, in common with other *Hipparchia* species occurring in arid, hot habitats (John and Parker 2002).

The Georgian records of *H. parisatis* are of particular zoogeographical interest because they are by far the northernmost known occurrences of the species anywhere in its range and the only ones north of the 41st parallel. The species map on the website of Butterfly Conservation Armenia (Aghababyan and Khanamirian 2024) shows that the nearest Armenian record is over 100 km to the south of the Georgian border, with the range of the species in that country described as "semi-deserts from Western regions to Southern and Southeastern parts of Armenia, thus occurring in elevation range between 400 and 1200 m a.s.l." (Aghababyan and Khanamirian 2024). This wide range disruption highlights the importance of the area where *H. parisatis* has been found in Georgia as a refugium of more southern, subtropical arid habitats (see Discussion).

Discussion

Georgia is a country with a very rich, yet still inadequately researched butterfly fauna (Vrabec et al. 2019). This is evident even from the considerable discrepancy in the species numbers reported for the country by various sources: 231 according to the Georgian Biodiversity Database (Tarkhnishvili et al. 2024), 228 according to Didmanidze (2004), and 211 according to Vrabec et al. (2019). The largest number (231 species) is exaggerated, as several species erroneously listed as occurring in Georgia by Tarkhnishvili et al. (2013) are based on Didmanidze (2004), many of whose previously published butterfly 'records' have been harshly criticized and shown to be untrue decades ago (Nekrutenko et al. 1982a, 1982b). On the other hand, as Vrabec et al. (2019) predicted and as the present report shows, new additions to the butterfly fauna of Georgia are also to be expected.

The herein summarized records of *Hipparchia parisatis*, apart from adding one more confirmed butterfly species to the fauna of Georgia, also highlight the importance of Vashlovani as a faunistically exceptional area for Georgia – a relic of subtropical arid western-Asian habitats that are nowadays mostly found much further south in Armenia and Azerbaijan. In addition to *H. parisatis*, five other butterfly taxa adapted to such habitats are known in Georgia only from Vashlovani: *Eogenes alcides* (Herrich-Schäffer, [1852]) (Hesperiidae), *Lachides galba* (Lederer, 1855), *Kretania stekolnikovi* Stradomsky & Tikhonov, 2015 (Lycaenidae), *Melitaea persea* Kollar, 1849, and *Melitaea abbas* Gross & Ebert, 1975 (Nymphalidae) (Tihonov et al. 2024). The area also harbors relict populations of several moth species, e.g., lappet moth (Lasiocampidae) *Pachypasa otus* (Drury, 1777) (Prozorov et al. 2022), hawkmoths (Sphingidae) *Smerinthus kindermannii* Lederer, 1852, *Akbesia davidi* (Oberthür, 1884) (Didmanidze et al. 2013), and the locally endemic *Holcocerus didmanidzae* Yakovlev 2006 (Yakovlev 2006; Didmanidze and Yakovlev 2007). For a broader discussion of the faunistic value of this area, with a focus on VNP, see Seropian et al. (2024). It is deservedly designated one of the Key Biodiversity Areas of the Caucasus

Ecoregion (Zazanashvili et al. 2020). The VPA (which comprises the eponymous VNR and VNP) was the first area in Georgia awarded with the European Diploma for its preservation of biological, geological, and landscape diversity in 2015; the term was renewed in 2020 for an extra 10 years until 2030 (Council of Europe 2024).

The present report also emphasizes the value of citizen science in general and web-based recording platforms and databases such as Observation.org and iNaturalist in particular for facilitating high-quality, evidence-based research on biodiversity. The value of these web-based platforms for gathering basic distribution data is already broadly recognized if not yet universally appreciated. However, the important aspect that we wish to underline is the need for professional biologists (taxonomists, ecologists, etc.) to interact and engage more actively with the abovementioned citizen science platforms. This should be done not merely to curate species determinations but, moreover, in order to properly assess the scientific significance of data recorded therein and facilitate further dissemination among the professional community and other potential stakeholders. In the present case, the older Georgian records of *H. parisatis* in the aforementioned platforms, the oldest dating back from 2016, would have remained unnoticed for who knows how long had it not been a professional biologist (J. Novák) who himself photographed the species there – only after that, in the course of writing the manuscript of this paper, did the older records come to light. Thus, a better appreciation of the benefits as well as drawbacks of citizen science is urgently needed among science professionals and scientific and administrative institutions. Only in this way can we hope to maximize the usefulness of citizens' initiative and capacity in the field of biodiversity research for the benefit of both science and society

Acknowledgements

We are grateful to Dr. Chris Van Swaay (Observation.org) for his kind advice on using web-based data recording platforms for publication purposes. Additionally we are thankful to Levan Mumladze (Subject editor) and two anonymous reviewers for evaluating our MS.

Additional information

Conflict of interest

The authors have declared that no competing interests exist.

Ethical statement

No ethical statement was reported.

Funding

JN made his 2023 observation of *H. parisatis* in the course of research funded by the Visegrad Scholarship Program (application ID #52310276).

Author contributions

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Data availability

All of the data that support the findings of this study are available in the main text.

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